Date : July 14, 2020

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 20G13-PTH01
Customer identification : Thyme Thymol organic - Spain - TO0102910R
Type : Essential oil
Source : *Thymus vulgaris* ct. Thymol
Customer : Plant Therapy

Analysis

Method: PC-MAT-014 ISO - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Sylvain Mercier, M. Sc., Chimiste
Analysis date : July 13, 2020

Checked and approved by :

Alexis St-Gelais, M. Sc., chimiste 2013-174

Notes: This report may not be published, including online, without the written consent from Laboratoire PhytoChemia. This report is digitally signed, it is only considered valid if the digital signature is intact. The results only describe the samples that were submitted to the assays.

Méthode certifiée ISO 17025:2017 Certified method

Laboratoire PhytoChemia
628 Boulevard du Saguenay Ouest, Saguenay (Qc) G7J 1H4 | www.phytochemia.com

PHYSICOCHEMICAL DATA

Physical aspect: Light yellow liquid
Refractive index: 1.5026 ± 0.0003 (20 °C; method PC-MAT-016)

ISO 19817:2017 - ESSENTIAL OIL OF THYME, THYMOL TYPE

Compound	Min. %	Max. %	Observed %	Complies?
β-Caryophyllene	0.5	4.0	1.3	Yes
Carvacrol	0.5	5.5	3.6	Yes
Thymol	35.0	55.0	52.6	Yes
Carvacrol methyl ether	0.1	1.5	0.2	Yes
Terpinen-4-ol	0.1	2.5	0.8	Yes
Linalool	0.5	6.5	4.5	Yes
cis-Sabinene hydrate	tr	0.50	0.20	Yes
para-Cymene	14.0	28.0	17.0	Yes
γ-Terpinene	4.0	13.0	9.0	Yes
α-Terpinene	0.9	2.6	1.3	Yes
Myrcene	1.0	2.8	1.6	Yes
α-Pinene	0.5	2.5	1.0	Yes
α-Thujene	0.5	1.5	0.8	Yes
Refractive index	1.4940	1.5040	1.5026	Yes

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method.

Analysis summary – Consolidated contents

New readers of similar reports are encouraged to read table footnotes at least once.

Identification	%	Class
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
Isoamyl alcohol	tr	Aliphatic alcohol
2-Methylbutanol	tr	Aliphatic alcohol
Methyl 2-methylbutyrate	0.01	Aliphatic ester
Octane	tr	Alkane
Unknown	tr	Unknown
(3*Z*)-Hexenol	0.01	Aliphatic alcohol
Hexanol	0.02	Aliphatic alcohol
Heptan-3-one	0.01	Aliphatic ketone
Hashishene	0.01	Monoterpene
Tricyclene	0.02	Monoterpene
α-Thujene	0.84	Monoterpene
α-Pinene	1.01	Monoterpene
Unknown	0.01	Monoterpene
Camphene	0.28	Monoterpene
α-Fenchene	0.01	Monoterpene
Thuja-2,4(10)-diene	0.01	Monoterpene
Sabinene	tr	Monoterpene
β-Pinene	0.17	Monoterpene
Octen-3-ol	0.05	Aliphatic alcohol
Octan-3-one	0.07	Aliphatic ketone
Myrcene	1.58	Monoterpene
Octan-3-ol	0.02	Aliphatic alcohol
α-Phellandrene	0.16	Monoterpene
Pseudolimonene	0.02	Monoterpene
Δ3-Carene	0.08	Monoterpene
α-Terpinene	1.27	Monoterpene
para-Cymene	17.02	Monoterpene
Limonene	0.34	Monoterpene
β-Phellandrene	0.20	Monoterpene
1,8-Cineole	0.11	Monoterpenic ether
(*Z*)-β-Ocimene	0.01	Monoterpene
(*E*)-β-Ocimene	0.06	Monoterpene
γ-Terpinene	9.00	Monoterpene
2-Methylbutyl butyrate	0.01	Aliphatic ester
cis-Sabinene hydrate	0.20	Monoterpenic alcohol
3-Methyl-3-butenyl butyrate?	0.02	Aliphatic ester
cis-Linalool oxide (fur.)	0.05	Monoterpenic alcohol
para-Cymenene	0.07	Monoterpene
trans-Linalool oxide (fur.)	0.07	Monoterpenic alcohol
Terpinolene	0.08	Monoterpene
Methyl benzoate	0.01	Phenolic ester
trans-Sabinene hydrate	0.09	Monoterpenic alcohol
Linalool	4.53	Monoterpenic alcohol

Nonanal	0.02	Aliphatic aldehyde
Hotrienol	0.02	Monoterpenic alcohol
endo-Fenchol	0.01	Monoterpenic alcohol
Unknown	0.06	Unknown
trans-Pinocarveol	0.04	Monoterpenic alcohol
Camphor	0.02	Monoterpenic ketone
trans-para-Menth-2-en-1-ol	0.02	Monoterpenic alcohol
Camphene hydrate	0.01	Monoterpenic alcohol
trans-Chrysanthemal	0.07	Monoterpenic aldehyde
Unknown	0.02	Oxygenated monoterpene
Isoborneol	0.01	Monoterpenic alcohol
Borneol	0.62	Monoterpenic alcohol
Terpinen-4-ol	0.77	Monoterpenic alcohol
para-Cymen-8-ol	0.02	Monoterpenic alcohol
α-Terpineol	0.05	Monoterpenic alcohol
cis-Dihydrocarvone	0.10	Monoterpenic ketone
Verbenone	0.02	Monoterpenic ketone
Bornyl formate	0.03	Monoterpenic ester
Thymol methyl ether	0.02	Monoterpenic ether
Neral	0.02	Monoterpenic aldehyde
Carvacrol methyl ether	0.21	Monoterpenic ether
Verbenone isomer?	0.07	Monoterpenic ketone
Thymol analogue I	0.11	Monoterpenic alcohol
Thymol	52.56	Monoterpenic alcohol
Thymol analogue II	0.12	Monoterpenic alcohol
Carvacrol	3.60	Monoterpenic alcohol
Thymyl acetate	0.02	Monoterpenic ester
Eugenol	0.01	Phenylpropanoid
α-Copaene	0.03	Sesquiterpene
β-Bourbonene	0.01	Sesquiterpene
Unknown	0.03	Unknown
Isocaryophyllene	0.01	Sesquiterpene
α-Gurjunene	0.02	Sesquiterpene
β-Caryophyllene	1.28	Sesquiterpene
Aromadendrene	0.09	Sesquiterpene
α-Humulene	0.06	Sesquiterpene
Unknown	0.24	Oxygenated monoterpene
allo-Aromadendrene	0.02	Sesquiterpene
Thymohydroquinone isomer?	0.03	Simple phenolic
(*E*)-β-Farnesene	0.09	Sesquiterpene
γ-Muurolene	0.03	Sesquiterpene
Germacrene D	0.01	Sesquiterpene
β-Selinene	0.02	Sesquiterpene
Viridiflorene	0.07	Sesquiterpene
α-Muurolene	0.03	Sesquiterpene
β-Bisabolene	0.01	Sesquiterpene
γ-Cadinene	0.02	Sesquiterpene
δ-Cadinene	0.08	Sesquiterpene
trans-Cadina-1,4-diene	0.02	Sesquiterpene
α-Cadinene	0.01	Sesquiterpene
Thymohydroquinone	0.02	Monoterpenic alcohol
Geranyl butyrate	0.05	Monoterpenic ester

Spathulenol	0.07	Sesquiterpenic alcohol
Caryophyllene oxide	0.14	Sesquiterpenic ether
Unknown	0.02	Oxygenated sesquiterpene
Humulene epoxide II	0.01	Sesquiterpenic ether
Geranyl isovalerate	0.04	Monoterpenic ester
Isospathulenol	0.02	Sesquiterpenic alcohol
τ-Cadinol	0.01	Sesquiterpenic alcohol
α-Cadinol	0.02	Sesquiterpenic alcohol
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	0.03	Sesquiterpenic alcohol
Unknown	0.03	Unknown
Unknown	0.05	Unknown
Unknown	0.07	Unknown
Unknown	0.01	Unknown
meta-Camphorene	0.01	Diterpene
Unknown	0.02	Unknown
Unknown	0.01	Unknown
Unknown	0.01	Unknown
Unknown	0.03	Unknown
Unknown	0.01	Unknown
Consolidated total	**99.11%**	

tr: The compound has been detected below 0.005% of total signal.

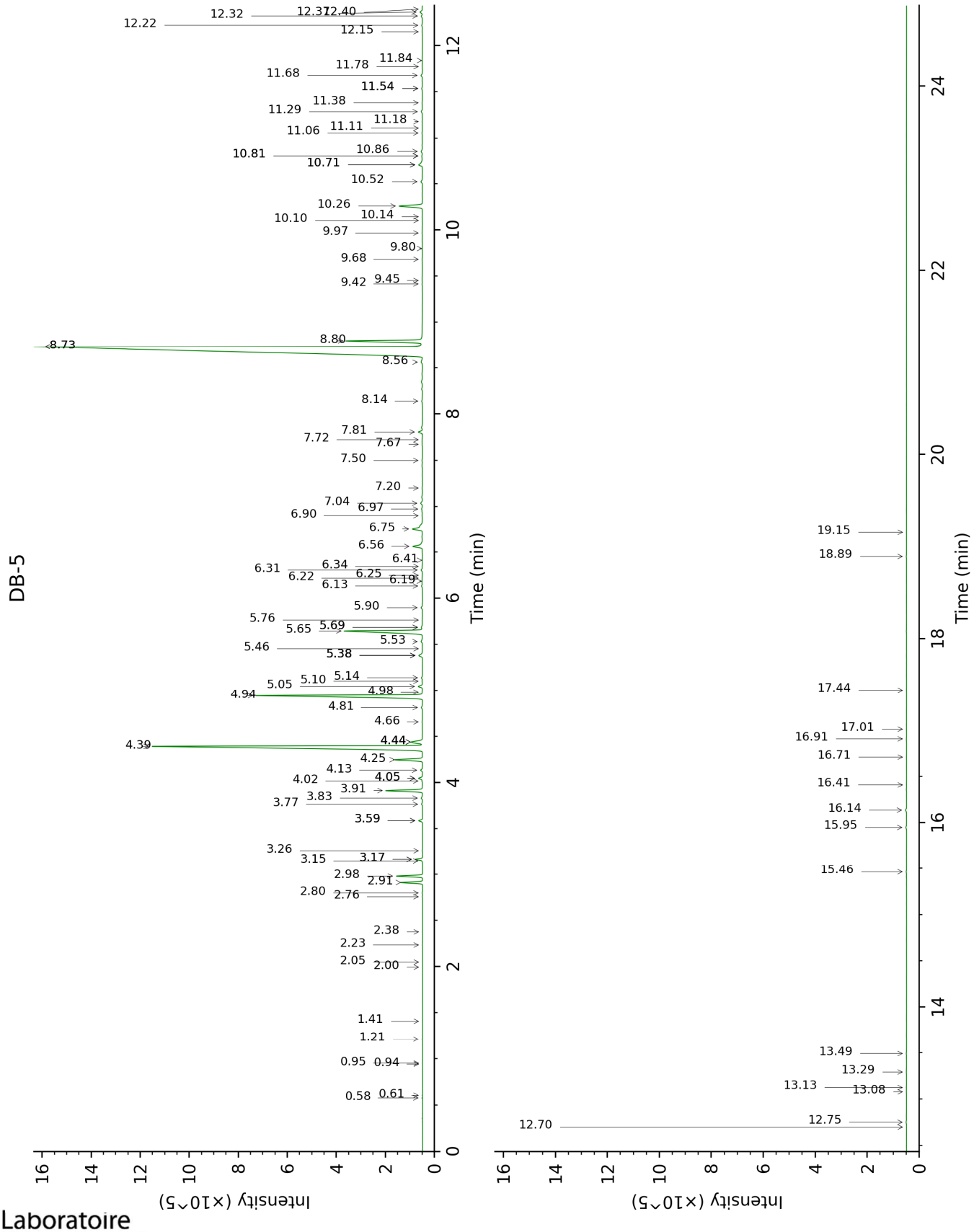
Note: no correction factor was applied

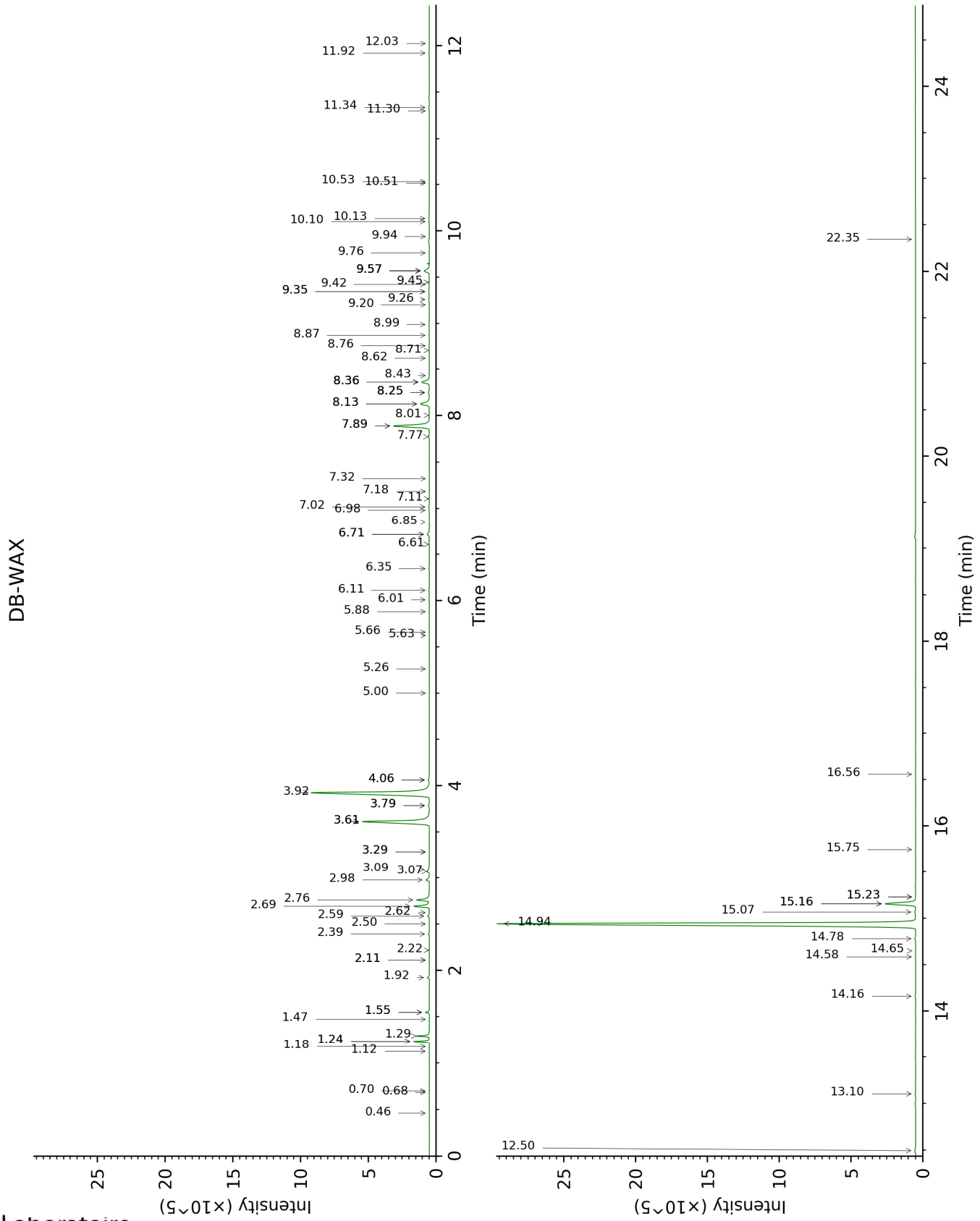
About "consolidated" data: The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm is set to prioritize data from the most standard DB-5 column, and smallest values so as to avoid overestimating individual content. This process is semi-automatic. Advanced users are invited to consult the "Full analysis data" table after the chromatograms in this report to access the full untreated data and perform their own calculations if needed.

Unknowns: Unknown compounds' mass spectral data is presented in the "Full analysis data" table. The occurrence of unknown compounds is to be expected in many samples, and does not denote particular problems unless noted otherwise in the conclusion.

This page was intentionally left blank. The following pages present the complete data of the analysis.

628 Boulevard du Saguenay, Saguenay (Qc) G7J 1H4 | www.phytochemia.com


DB-5
Intensity (×10^5)
Time (min)
12.32
12.37
12.40
12.22
12.15
11.78
11.84
11.68
11.54
11.38
11.29
11.18
11.06
11.11
10.86
10.81
10.71
10.52
10.26
10.14
10.10
9.97
9.80
9.68
9.45
9.42
8.80
8.73
8.56
8.14
7.81
7.72
7.67
7.50
7.20
7.04
6.97
6.90
6.75
6.56
6.41
6.34
6.31
6.25
6.22
6.19
6.13
5.90
5.76
5.69
5.65
5.53
5.46
5.38
5.14
5.10
5.05
4.98
4.94
4.81
4.66
4.44
4.39
4.25
4.13
4.05
4.02
3.91
3.83
3.77
3.59
3.26
3.17
3.15
2.98
2.91
2.80
2.76
2.38
2.23
2.05
2.00
1.41
1.21
0.95
0.94
0.61
0.58
19.15
18.89
17.44
17.01
16.91
16.71
16.41
16.14
15.95
15.46
13.49
13.29
13.13
13.08
12.75
12.70


DB-WAX
Intensity (×10^5)
Time (min)
12.03
11.92
11.34
11.30
10.53
10.51
10.10
10.13
9.94
9.76
9.57
9.42
9.45
9.35
9.20
9.26
8.99
8.87
8.76
8.71
8.62
8.43
8.36
8.25
8.13
8.01
7.89
7.77
7.32
7.18
7.11
7.02
6.98
6.85
6.71
6.61
6.35
6.11
6.01
5.88
5.66
5.63
5.26
5.00
4.06
3.92
3.79
3.61
3.29
3.09
3.07
2.98
2.76
2.69
2.59
2.62
2.50
2.39
2.22
2.11
1.92
1.55
1.47
1.29
1.24
1.18
1.12
0.70
0.68
0.46
22.35
16.56
15.75
15.23
15.16
15.07
14.94
14.78
14.65
14.58
14.16
13.10
12.50

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Isovaleral	0.58	639	0.01	0.70	883	0.01
2-Methylbutyral	0.61	652	0.01	0.68	876	0.01
Isoamyl alcohol	0.94	741	tr	3.29*	1180	0.01
2-Methylbutanol	0.95	742	tr	3.29*	1180	[0.01]
Methyl 2-methylbutyrate	1.21	779	0.01	1.18	975	0.01
Octane	1.41	807	tr	0.46	773	0.01
Unknown [m/z 109, 43 (28), 124 (28), 41 (14), 55 (11), 79 (9), 81 (8)...]	2.00	856	tr	1.55*	1022	0.28
(3*Z*)-Hexenol	2.05	860	0.01	5.63	1348	0.01
Hexanol	2.24	875	0.02	5.26	1322	0.02
Heptan-3-one	2.38	887	0.01	2.50	1116	0.01
Hashishene	2.76	916	0.01	1.24*	985	0.97
Tricyclene	2.80	918	0.02	1.12	965	0.01
α-Thujene	2.91	926	0.84	1.30	996	0.85
α-Pinene	2.98	930	1.01	1.24*	985	[0.97]
Unknown [m/z 91, 92 (47), 65 (11)... 134 (1)]	3.15	942	0.01	2.22	1092	0.02
Camphene	3.17*	943	0.30	1.55*	1022	[0.28]
α-Fenchene	3.17*	943	[0.30]	1.47	1014	0.01
Thuja-2,4(10)-diene	3.26	949	0.01	2.11*	1081	0.02
Sabinene	3.59*	970	0.17	2.11*	1081	[0.02]
β-Pinene	3.59*	970	[0.17]	1.92	1062	0.17
Octen-3-ol	3.76	982	0.05	6.61	1420	0.06
Octan-3-one	3.83	986	0.07	3.78*	1218	0.12
Myrcene	3.91	992	1.58	2.69	1132	1.50
Octan-3-ol	4.02	999	0.02	5.88	1366	0.04
α-Phellandrene	4.05*	1000	0.20	2.59	1123	0.16
Pseudolimonene	4.05*	1000	[0.20]	2.62	1126	0.02
Δ3-Carene	4.13	1006	0.08	2.39	1107	0.08
α-Terpinene	4.25	1013	1.27	2.76	1137	1.32
para-Cymene	4.39	1022	17.02	3.92	1228	17.04
Limonene	4.44*	1025	0.72	2.98	1155	0.34
β-Phellandrene	4.44*	1025	[0.72]	3.07	1162	0.20
1,8-Cineole	4.44*	1025	[0.72]	3.09	1164	0.11
(*Z*)-β-Ocimene	4.66	1039	0.01	3.61*	1205	8.95
(*E*)-β-Ocimene	4.81	1049	0.06	3.78*	1218	[0.12]
γ-Terpinene	4.94	1057	9.00	3.61*	1205	[8.95]
2-Methylbutyl butyrate	4.98	1059	0.01	4.06*	1239	0.14
cis-Sabinene hydrate	5.05	1063	0.20	6.72*	1428	0.27
3-Methyl-3-butenyl butyrate?	5.10	1067	0.02	5.00	1303	0.01
cis-Linalool oxide (fur.)	5.14	1069	0.05	6.35	1400	0.05
para-Cymenene	5.38*	1084	0.23	6.11	1383	0.07

trans-Linalool oxide (fur.)	5.38*	1084	[0.23]	6.72*	1428	[0.27]
Terpinolene	5.38*	1084	[0.23]	4.06*	1239	[0.14]
Methyl benzoate	5.46	1089	0.01	8.43	1559	0.01
trans-Sabinene hydrate	5.53	1094	0.09	7.77	1507	0.10
Linalool	5.65†	1101	4.57	7.89*	1516	4.59
Nonanal	5.69*†	1104	[4.57]	5.66	1350	0.02
Hotrienol	5.69*†	1104	[4.57]	8.62	1573	0.02
endo-Fenchol	5.76	1109	0.01	8.13*	1535	1.27
Unknown [m/z 81, 79 (19), 41 (12), 92 (8), 77 (8)...]	5.90	1118	0.06	6.01	1376	0.06
trans-Pinocarveol	6.13	1133	0.04	8.87	1593	0.05
Camphor	6.19	1136	0.02	6.98	1448	0.04
trans-para-Menth-2-en-1-ol	6.22	1138	0.02	8.76	1584	0.03
Camphene hydrate	6.25	1140	0.01	8.25*	1544	0.15
trans-Chrysanthemal	6.31	1144	0.07	7.02	1450	0.07
Unknown [m/z 123, 81 (60), 67 (49), 95 (36), 41 (29), 68 (25)...152 (2)]	6.34	1146	0.02	7.11	1457	0.03
Isoborneol	6.41	1151	0.01	9.20	1620	0.01
Borneol	6.56	1160	0.62	9.57*	1649	0.75
Terpinen-4-ol	6.75	1173	0.77	8.36*	1553	1.00
para-Cymen-8-ol	6.90	1182	0.02	11.30	1794	0.01
α-Terpineol	6.97	1187	0.05	9.57*	1649	[0.75]
cis-Dihydrocarvone	7.04	1191	0.10	8.25*	1544	[0.15]
Verbenone	7.20	1202	0.02	9.42	1637	0.03
Bornyl formate	7.50	1222	0.03	7.89*	1516	[4.59]
Thymol methyl ether	7.67	1234	0.02	8.25*	1544	[0.15]
Neral	7.72	1238	0.02	9.26	1624	0.10
Carvacrol methyl ether	7.81	1244	0.21	8.36*	1553	[1.00]
Verbenone isomer?	8.14	1266	0.07			
Thymol analogue I	8.56	1296	0.11	14.78	2116	0.10
Thymol	8.73*	1303	52.60	14.94	2132	52.56
Thymol analogue II	8.73*	1303	[52.60]	15.07	2145	0.12
Carvacrol	8.80	1307	3.60	15.16*	2154	3.51
Thymyl acetate	9.42	1351	0.02	11.34	1797	0.07
Eugenol	9.45	1354	0.01	14.58	2097	0.05
α-Copaene	9.68	1370	0.03	6.85	1438	0.01
β-Bourbonene	9.80	1378	0.01	7.18	1463	0.01
Unknown [m/z 148, 133 (66), 105 (46), 43 (33), 77 (15)...]	9.97	1390	0.03			
Isocaryophyllene	10.10	1400	0.01	8.00	1525	0.04
α-Gurjunene	10.14	1403	0.02	7.32	1473	tr
β-Caryophyllene	10.26	1411	1.28	8.13*	1535	[1.27]
Aromadendrene	10.52	1431	0.09	8.36*	1553	[1.00]
α-Humulene	10.71*	1445	0.30	8.99	1602	0.06

Unknown [m/z 151, 166 (40), 105 (26)...]	10.71*	1445	[0.30]			
allo-Aromadendrene	10.81*	1452	0.06	8.70	1580	0.02
Thymohydroquinone isomer?	10.81*	1452	[0.06]			
(*E*)-β-Farnesene	10.86	1456	0.09	9.35*	1631	0.12
γ-Muurolene	11.06	1471	0.03	9.35*	1631	[0.12]
Germacrene D	11.11	1475	0.01	9.57*	1649	[0.75]
β-Selinene	11.18	1480	0.02	9.57*	1649	[0.75]
Viridiflorene	11.29	1488	0.07	9.45	1639	0.02
α-Muurolene	11.38	1495	0.03	9.76	1665	0.03
β-Bisabolene	11.54*	1507	0.06	9.94	1679	0.01
γ-Cadinene	11.54*	1507	[0.06]	10.10	1692	0.02
δ-Cadinene	11.68	1518	0.08	10.13	1695	0.09
trans-Cadina-1,4-diene	11.78	1526	0.02	10.51	1727	0.02
α-Cadinene	11.84	1531	0.01	10.53	1729	0.02
Thymohydroquinone	12.15	1555	0.02	22.35	2982	0.01
Geranyl butyrate	12.22	1561	0.05	11.92	1849	0.05
Spathulenol	12.32	1569	0.07	14.16	2056	0.08
Caryophyllene oxide	12.37	1572	0.14	12.50	1900	0.13
Unknown [m/z 161, 187 (29), 105 (24), 91 (23), 93 (23)... 205 (19), 220? (2)]	12.40	1575	0.02			
Humulene epoxide II	12.70	1599	0.01	13.10	1956	0.08
Geranyl isovalerate	12.75	1603	0.04	12.03	1858	0.02
Isospathulenol	13.08	1630	0.02	15.23*	2161	0.02
τ-Cadinol	13.13	1634	0.01	14.65	2103	0.01
α-Cadinol	13.29	1647	0.02	15.23*	2161	[0.02]
(3*Z*)-Caryophylla-3,8(13)-dien-5β-ol	13.49	1664	0.03	16.56	2298	0.03
Unknown [m/z 81, 136 (68), 135 (58), 150 (44), 93 (34), 121 (30)...]	15.46	1835	0.03			
Unknown [m/z 81, 136 (62), 135 (56), 150 (39), 93 (33), 121 (24)...]	15.95	1879	0.05			
Unknown [m/z 136, 81 (96), 135 (76), 93 (48), 150 (47), 121 (43), 137 (28)...]	16.14	1896	0.07			
Unknown [m/z 136, 81 (81), 150 (74), 135 (52), 93 (46), 121 (42)...]	16.41	1921	0.01	15.75	2213	0.02
meta-Camphorene	16.71	1950	0.01	15.16*	2154	[3.51]
Unknown [m/z 135, 150 (90), 201 (83), 81 (52), 136 (35)... 286	16.91	1969	0.02			

(25)]				
Unknown [m/z 135, 150 (61), 81 (45), 69 (37), 41 (24), 136 (21), 93 (19)...]	17.01	1979	0.01	
Unknown [m/z 135, 150 (67), 69 (57), 41 (24)...]	17.44	2020	0.01	
Unknown [m/z 267, 282 (24), 268 (21), 117 (16), 126 (11)...]	18.89	2166	0.03	
Unknown [m/z 175, 163 (78), 161 (33), 41 (32)... 286 (18)]	19.15	2193	0.01	
Total identified		**98.77%**		**98.43%**
Total reported		**99.14%**		**98.55%**

*: Two or more compounds are coeluting on this column
[xx]: Duplicate percentage due to coelutions, not taken into account in the consolidated total
†: Peaks apexes were resolved, but peaks overlapped and were summed for analysis
tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied
R.T.: Retention time (minutes)
R.I.: Retention index